

diameter smaller than that of the micropores of the outermost layer and the innermost layer, is disposed as intermediate layer(s), between the outermost layer and the innermost layer, wherein the composite hollow fiber membrane has overall porosity of not less than 75% by volume, and wherein

the isothermal crystallization time τ_s of the resin used for the outermost layer and the innermost layer and the isothermal crystallization time τ_p of the resin used for the dense layer satisfy the following relationship:

$$1 < \tau/\tau_s < 100.$$

REMARKS

The Examiner is thanked for the courteous interview conducted on April 16, 2003 in which the issues in the case were clarified.

According to the Examiner's suggestion, Claim 1, line 5 has been amended to insert "said dense layer(s) being" before the term "thinner" and to insert "said dense layer(s)" after the term "and". No new matter has been added into the amended claim. It is requested that this amendment be entered, since it was made at the request of the Examiner.

REQUEST FOR RECONSIDERATION

Claims 1, 3-8 and 11-17 are active in the case.

The rejection of Claims 1, 3-8 and 11-17 under 35 U.S.C. §103(a) as unpatentable over EP 0 740 952 alone or in view of JP 3-169330 (Abstract) is traversed.

The Examiner refers to Table 1, page 13 of EP 0 740 952 as showing a porosity overlapping with the porosity of present Claim 1, which reads "wherein the composite hollow fiber membrane has overall porosity of not less than 75% by volume". However, it can be

seen from a reading of the examples of EP 0 740 952 that Examples 1, 2 and 4-10 are all directed to two layer hollow fiber membranes and only Example 3 is directed to a three layer hollow fiber membrane overlapping with the hollow fiber membrane of present Claim 1. However, the hollow fiber membrane of Example 3 shows a porosity of only 64%, far lower than the “not less than 75% by volume” of present Claim 1. Therefore, there is no teaching or suggestion in EP 0 740 952 to produce a three layer hollow fiber membrane which has an overall porosity of not less than 75% by volume, as in present Claim 1.

The Examiner also argues that a ratio of the isothermal crystallization time of the resin used for the outermost layer and the innermost layer and the isothermal crystallization time of the resin used for the dense layer is either an inherent physical property of the polyolefins selected for the membrane manufacturing process, or an obvious optimization to one of ordinary skill in the art. However, since the above ratio depends on the particular resins used in the layers of the hollow fiber membrane and not on the manufacturing process and EP 0 740 952 neither teaches nor suggests an isothermal crystallization time for the resins used in the hollow fiber membrane of EP 0 740 952 reference, much less a ratio between the isothermal crystallization time of the resin used for the outermost layer and the innermost layer and the isothermal crystallization time of the resin used for the dense layer, as in present Claim 1, there is no motivation to the worker of ordinary skill in the art from EP 0 740 952 to arrive at the above ratio of present Claim 1. The Examiner’s interpretation of the teachings of EP 0 740 952 is an impermissible reconstruction of the prior art in light of Applicants’ disclosure. As argued on page 5 in the previous response, JP 3-169330 (Abstract) does not remedy the deficiencies of the European patent, because the void ratio described in the Abstract of the Japanese patent refers only to layer (B) as having a void ratio of 30-90% and does not refer to the overall porosity of the composite hollow fiber membrane being not less than 75% by volume. Further, there is no mention in the Abstract of the

Japanese patent of any isothermal crystallization time for any resin in the Japanese patent, much less the ratio of isothermal crystallization times of the resins of the layers in present Claim 1, as discussed above. The claims distinguish over the combination of references.

Finally, to further support the contention that the claims distinguish over the combination of references, the Examiner is directed to comparative data in the specification in which Examples 1-5 of the present invention, having porosities within the range of present Claim 1 and being three layer composite hollow fiber membranes, are compared to Comparative Examples 1 and 2, which are two layer composite hollow fiber membranes and have porosities outside the range of present Claim 1, but within the range of porosities of Table 1 on page 13 of EP 0 740 952. The three layer composite hollow fiber membrane of Examples 1-5, according to present Claim 1, shows superior results in water permeation amounts, which range from 35.5 to 38.6 L/(m²hrKPa), as compared to 33.4 and 32.1 for Comparative Examples 1 and 2, respectively. Further, in a continuous water permeation test set forth on pages 43 and 44 of the specification, which is displayed under the heading “Accumulated Amount of Water Permeated Through Continuous Water Permeation Test”, superior results are shown for Examples 1-5, according to present Claim 1, ranging from 65.0 to 90.6 L/(m²KPa), as compared to 60.2 and 22.5 for Comparative Examples 1 and 2, respectively. Therefore, it is clear that the superior results demonstrated for the three layer composite hollow fiber membranes having a porosity of not less than 75% by volume of present Claim 1, as compared to two layer composite hollow fiber membranes having a porosity outside the range of present Claim 1 and falling within the porosity range of Table 1 of EP 0 740 952, also distinguish the claims over the combination of references.

The rejection of Claims 1, 3-8 and 11-17 under 35 U.S.C. §112, first and second paragraphs is traversed.


The Examiner refers to five "comprising" terms in Claim 1, as making the claims unduly broad and indefinite.

However, there is no basis in patent law or the M.P.E.P. for the Examiner's position, since the term "comprising" is an open ended term and there is nothing in the present specification that would require Applicants to limit Claim 1 by using terms which are more closed, such as "consisting essentially of" or "consisting of". It is submitted that other terms which could be substituted for "comprising", such as "including" or "having" are also open ended terms and are no different in scope from the use of the term "comprising". Therefore, it is submitted that the use of the term "comprising" is proper and Claim 1 meets the requirements of 35 U.S.C. §112, first and second paragraphs.

It is submitted that Claims 1, 3-8 and 11-17 are allowable and such action is respectfully requested.

Respectfully submitted,

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AMENDMENT UNDER 37 C.F.R. §1.116

IN THE CLAIMS

--1. (Twice Amended) A composite hollow fiber membrane comprising three or more layers of membrane comprising a three-dimensional net structure comprising a plurality of micropores comprising stacked lamella and micro fibrils connected with the stacked lamella, wherein

one or more dense layer(s), said dense layer(s) being thinner than an outermost layer and an innermost layer and said dense layer(s) comprising micropores of a mean pore diameter smaller than that of the micropores of the outermost layer and the innermost layer, is disposed as intermediate layer(s), between the outermost layer and the innermost layer, wherein the composite hollow fiber membrane has overall porosity of not less than 75% by volume, and wherein

the isothermal crystallization time τ_s of the resin used for the outermost layer and the innermost layer and the isothermal crystallization time τ_p of the resin used for the dense layer satisfy the following relationship:

$$1 < \tau/\tau_s < 100.--$$